This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

GODFREY LOWELL CABOT SCIENCE LIBRARY
of the Harvard College Library

This book is
FRAGILE
and circulates only with permission.
Please handle with care
and consult a staff member
before photocopying.

Thanks for your help in preserving
Harvard's library collections.


Eng 1078.
GODFREY

Eng 1078.

GODFREY

REPORT

ON

TIDAL INVESTIGATIONS

IN

MYSTIC RIVER AND POND.

MADE BY ORDER OF THE CITY COUNCIL OF THE CITY OF CHARLESTOWN.

C. L. STEVENSON, CIVIL ENGINEER.

BOSTON:
DAVIS AND FARMER, PRINTERS,
18 EXCHANGE STREET.
1861.

Eng 1078.61.7

HARVARD COLLEGE
Apr 11. 1931
LIBRARY

James R. Balderston

CITY OF CHARLESTOWN.

BOARD OF MAYOR AND ALDERMEN,
Aug. 21st, 1860.

ORDERED, That the Joint Special Committee on the subject of Soft Water be authorized to secure the services of C. L. STEVENSON, Esq., for the purpose of testing the effect on Boston Harbor of the ebb and flow of the tide in Mystic River; also the effect on the same likely to be produced by the building of a dam across the outlet of Mystic Pond.

IN BOARD OF MAYOR AND ALDERMEN,
January 2, 1861.

Read, and ordered that two hundred copies of the same be printed for the use of the City Council, and sent down for concurrence.

CHARLES POOLE, *City Clerk.*

IN COMMON COUNCIL, Jan. 2, 1861.

Concurred.

GUSTAVUS V. HALL, *Clerk.*

REPORT.

To the Honorable the City Council of the City of Charlestown:

In pursuance of the order of the City Council, passed August 21st, 1860, the required surveys and examinations have been made for testing the effect on Boston Harbor of the ebb and flow of the tide in Mystic River, as also the effect on the same likely to be produced by the building of a dam across the outlet of Mystic Pond.

The necessarily very large amount of data collected in making the investigations, while it will prove of value to many of the interests of the City in the river and harbor, admits of determining with very considerable accuracy, the question which was the immediate occasion of these examinations, viz.:— Whether a diversion of a portion of the waters of Mystic Pond, for the use of Charlestown, would injuriously affect Mystic River or Boston Harbor? A report on all the results obtained would occupy more time than my present engagements admit, and the accompanying pages are mainly devoted to the principal questions at issue. By the courtesy of the Har-

bor Commissioners, who had detailed a party under charge of Ass't Henry Mitchell, U. S. C. S., to make similar examinations, I was early placed in communication with that gentleman, and agreeably to his letter of August 27, (*vide* paper A,) the arrangement was made whereby our respective parties were enabled to work together. This arrangement, as was subsequently proved, worked admirably, admitting, as it did, of simultaneous observations, which would have been impossible for either party alone, and which were trebly of value to both.

To the skill and experience of the assistant in charge of their party, I am indebted for much valuable information and for many happy expedients to facilitate the work in hand. To Mr. T. J. Niles, and other abuttors on the pond, my thanks are due for many courtesies and facilities extended.

The duration of the flood and ebb currents in Boston Harbor, is, according to the U. S. C. S., 6h. 10m. respectively, and the duration of the flood as we pass into and up Mystic River, decreases, while there is a corresponding increase in the duration of ebb. As it is due to the action of these two forces that the harbor is kept open, it is first essential to ascertain their limit of value, or the comparative value of this river as a tidal reservoir; the configuration of the river leading me to start with the hypothesis that the forces due to the fresh water stream would not be appreciable upon the harbor, and that the maintenance of the channels is due almost entirely to tidal waters—an hypothesis, the correctness of which the subsequent observations show. The lower reaches of the river, as

far up as the "Ten Hills Farm," form a large estuary of irregular width, which at low water is only partially occupied by the channel, which, with many crooks and crossings from side to side, finally enters the harbor below Chelsea Bridge. Above the "Ten Hills Farm" the space between the banks is very narrow, being but one-twelfth the width of the estuary below, and is entirely filled at high water, the river there assuming the lagoon shape. When we compare the inferior sectional size of this river in the upper portions with that which it attains at the estuary and outlet, we may assume almost as an axiom that the tidal influences are paramount to all others in any effect on the harbor, while the feeble action of the fresh water stream can only be felt in the upper reaches of the river.

The points selected as best suited for observations, were as follows:—

TIDAL STATIONS.		CURRENT STATIONS.	
Abajonna River, outlet,	1	Abajonna River,	A
Niles Boat House, Lower Pond,	2	Middle of Upper Pond,	1
Wier Bridge,	3	Middle of Lower Pond,	2
Wood's Mill,	4	Narrows,	B
Herring Wier,	5	Wier Bridge,	3
Medford Draw Bridge,	6	Wood's Mill,	4
Ten Hills Farm,	7	Herring Wier,	5
U. S. Navy Yard,	8	Medford Draw Bridge,	6
		Ten Hills Farm,	7
Schooner Bailey, above Boston & Maine R. R.			8
" " "		Chelsea Bridge,	9
" "		off Navy Yard,	10

Low water line of Boston Harbor was taken as a datum plane, and all levels referred thereto, permanent

bench-marks being established at or near all tidal stations. Observations were made at intervals of fifteen minutes during the flow of the current in any one direction, and as much oftener at the changes as was deemed necessary. These observations show the progress of the tides, their height, duration and the force and direction of the currents. The tidal curves have been carefully plotted, and tabular sheets relating to the currents made out. Cross sections of the bed of the river from Medford Bridge to the Abajonna stream were obtained, as also a longitudinal profile of the bed of the river and Mystic Pond from the Abajonna to Chelsea Bridge, all of which are shown on the accompanying plan.

By examining the profile of the river it will be seen that above Medford Bridge the bed gradually rises from a level about that of low water mark of the harbor to a point at Wood's Mill, 8½ feet above that level, or some 1½ feet only below the level of high water; so that the bed of the river from Medford up to the pond would be bare at every low tide, like the flats on the sides of the river lower down, were it not for the small fresh water stream; and which stream continues to flow down during the *rising* of the tide until near the end of the flood; the backed-up fresh water occupying the bed of the river in the upper reaches, and if the tide is of sufficient height is forced back into Mystic Pond.

One effect of the elevation of the bed of the river above low-water line is, that the commencement of flood current at Wood's Mill is between five and six hours later than at the Navy Yard or mouth of the river, so that the ebb tide at the mouth commences but a

few moments subsequent to the appearance of the flood at Wood's Mill; the duration of the flood current at Wood's Mill and the pond varying as the height of the tide is greater or less than that of the pond, from 0 to 2½ hours. So small is the volume of the fresh water as compared with that of the tidal flow, and flowing down as it does mainly during the time of flood or upward current below Medford, that practically its influence is not felt much, if any, below that point. The average volume of tidal water flowing into and out of the river is at every tide about 320 millions cubic feet.

Summing up the observations, we find the ordinary limit of the tidal wave to be at or near Wood's Mill, and beyond this point the river ceases to be of value at present as a tidal basin of the harbor.

The fact of Wood's Mill being the limit of the wave up the river is also of value in showing that the admixture of sea water with the fresh waters of the lower Mystic Pond is of rare occurrence, and is due to storm or unusual high tides which carry the wave higher up or into the pond. The chemical analyses, hereinafter alluded to, of the pond waters lead to the same conclusions.

The average volume of the flood current into the Mystic Pond, as found from observations, is one million cubic feet, or seven and one half million gallons at a tide; and while this quantity flows in during two hours or less, it occupies three or four hours in passing back into the river. Had the observations been continued for a longer period, or for a year, so as to bring into the account the neap tides and the seasons when

the height of the pond is such that no current can pass into it, this average would doubtless be much less. It is this inflow only that the erection of a dam at the outlet would prevent. While the volume of the flow into the pond is possibly of some little value to the *river* in increasing the downward current, the proportion which it bears to the average tidal inflow above Chelsea Bridge, less than one three hundred and twentieth, is too small to allow of its effects being appreciable in the *harbor*, even were the pond not at so great a distance from the latter, that waters therefrom do not in one tide reach it. The tide, in fact, would have commenced to run up the river at Chelsea Bridge some ninety minutes only after the quantity of water flowed into the pond had again flowed into the river.

The average duration of the ebb at Mystic Pond is about twenty hours a day (or ten hours for each tide,) during which time the daily fresh water yield and the water flowed into the pond from the river must pass out of the pond. Now we find that of the ten hours of ebb there are but about five hours during which the ebb current is unobstructed, the flood current colliding therewith during the remaining five hours. The volume of water, then, which flows down during the first five hours of the ebb is alone of value in acting as a scouring agent, and that only in the upper reaches of the river. It should be borne in mind that the time taken in passing from Wood's Mill to the head of estuary, "Ten Hills," 4¼ miles, is about four hours, as calculated from observations; hence there remains but one hour during which any *water from Mystic Pond* passes below the head of the estuary. To reach

Chelsea Bridge, 2½ miles further, assuming even the maximum velocity observed at any time of ebb tide of October 3d,* viz., six tenths of a mile per hour, requires 4h. 10m; or, in other words, *the tide would have turned to run flood, or up the river, at Chelsea Bridge some three and a quarter hours before a drop of water from Mystic Pond could have reached the harbor at Chelsea Bridge.*

From these facts we arrive at the conclusion that Mystic Pond is not a tidal reservoir of value to Boston Harbor.

To exemplify the colliding of the ebb and flood currents, let us take the tidal observations of October 3d. On this day the flood current commenced at the Navy Yard at 7h. 15m., A. M., while it continued to run ebb at Wood's Mill until 1h. 9m., P. M., a period of 5h. 54m.

An average of observations made on board the schooner Bailey, and at the current stations numbered 4, 6 and 7, at other dates than October 3d, show a duration of stand at flood at various points, as follows:

Broad Sound, 7m.

T. S. No. 9. Mystic River above Chelsea Bridge, 43m.; the day tide stand being 58m.; the night, 28m.

T. S. No. 8. Above B. & M. R. R., 51m.; the day tide stand being 1h. 23m., the night 40m.

T. S. No. 7. Head of estuary, above "Ten Hills Farm," 19m.

* The observations of this day are taken as an illustration from the greater number of simultaneous observations made, and from the fact of being an average tide. *Vide* plot of same, sheet H.

the height of the pond is such that no current can pass into it, this average would doubtless be much less. It is this inflow only that the erection of a dam at the outlet would prevent. While the volume of the flow into the pond is possibly of some little value to the *river* in increasing the downward current, the proportion which it bears to the average tidal inflow above Chelsea Bridge, less than one three hundred and twentieth, is too small to allow of its effects being appreciable in the *harbor*, even were the pond not at so great a distance from the latter, that waters therefrom do not in one tide reach it. The tide, in fact, would have commenced to run up the river at Chelsea Bridge some ninety minutes only after the quantity of water flowed into the pond had again flowed into the river.

The average duration of the ebb at Mystic Pond is about twenty hours a day (or ten hours for each tide,) during which time the daily fresh water yield and the water flowed into the pond from the river must pass out of the pond. Now we find that of the ten hours of ebb there are but about five hours during which the ebb current is unobstructed, the flood current colliding therewith during the remaining five hours. The volume of water, then, which flows down during the first five hours of the ebb is alone of value in acting as a scouring agent, and that only in the upper reaches of the river. It should be borne in mind that the time taken in passing from Wood's Mill to the head of estuary, "Ten Hills," 4¼ miles, is about four hours, as calculated from observations; hence there remains but one hour during which any *water from Mystic Pond* passes below the head of the estuary. To reach

Chelsea Bridge, 2½ miles further, assuming even the maximum velocity observed at any time of ebb tide of October 3d,* viz., six tenths of a mile per hour, requires 4h. 10m; or, in other words, *the tide would have turned to run flood, or up the river, at Chelsea Bridge some three and a quarter hours before a drop of water from Mystic Pond could have reached the harbor at Chelsea Bridge.*

From these facts we arrive at the conclusion that Mystic Pond is not a tidal reservoir of value to Boston Harbor.

To exemplify the colliding of the ebb and flood currents, let us take the tidal observations of October 3d. On this day the flood current commenced at the Navy Yard at 7h. 15m., A. M., while it continued to run ebb at Wood's Mill until 1h. 9m., P. M., a period of 5h. 54m.

An average of observations made on board the schooner Bailey, and at the current stations numbered 4, 6 and 7, at other dates than October 3d, show a duration of stand at flood at various points, as follows:

Broad Sound, 7m.

T. S. No. 9. Mystic River above Chelsea Bridge, 43m.; the day tide stand being 58m.; the night, 28m.

T. S. No. 8. Above B. & M. R. R., 51m.; the day tide stand being 1h. 23m., the night 40m.

T. S. No. 7. Head of estuary, above "Ten Hills Farm," 19m.

* The observations of this day are taken as an illustration from the greater number of simultaneous observations made, and from the fact of being an average tide. *Vide* plot of same, sheet H.

the height of the pond is such that no current can pass into it, this average would doubtless be much less. It is this inflow only that the erection of a dam at the outlet would prevent. While the volume of the flow into the pond is possibly of some little value to the *river* in increasing the downward current, the proportion which it bears to the average tidal inflow above Chelsea Bridge, less than one three hundred and twentieth, is too small to allow of its effects being appreciable in the *harbor*, even were the pond not at so great a distance from the latter, that waters therefrom do not in one tide reach it. The tide, in fact, would have commenced to run up the river at Chelsea Bridge some ninety minutes only after the quantity of water flowed into the pond had again flowed into the river.

The average duration of the ebb at Mystic Pond is about twenty hours a day (or ten hours for each tide,) during which time the daily fresh water yield and the water flowed into the pond from the river must pass out of the pond. Now we find that of the ten hours of ebb there are but about five hours during which the ebb current is unobstructed, the flood current colliding therewith during the remaining five hours. The volume of water, then, which flows down during the first five hours of the ebb is alone of value in acting as a scouring agent, and that only in the upper reaches of the river. It should be borne in mind that the time taken in passing from Wood's Mill to the head of estuary, "Ten Hills," 4¼ miles, is about four hours, as calculated from observations; hence there remains but one hour during which any *water from Mystic Pond* passes below the head of the estuary. To reach

Chelsea Bridge, 2½ miles further, assuming even the maximum velocity observed at any time of ebb tide of October 3d,* viz., six tenths of a mile per hour, requires 4h. 10m; or, in other words, *the tide would have turned to run flood, or up the river, at Chelsea Bridge some three and a quarter hours before a drop of water from Mystic Pond could have reached the harbor at Chelsea Bridge.*

From these facts we arrive at the conclusion that Mystic Pond is not a tidal reservoir of value to Boston Harbor.

To exemplify the colliding of the ebb and flood currents, let us take the tidal observations of October 3d. On this day the flood current commenced at the Navy Yard at 7h. 15m., A. M., while it continued to run ebb at Wood's Mill until 1h. 9m., P. M., a period of 5h. 54m.

An average of observations made on board the schooner Bailey, and at the current stations numbered 4, 6 and 7, at other dates than October 3d, show a duration of stand at flood at various points, as follows:

Broad Sound, 7m.

T. S. No. 9. Mystic River above Chelsea Bridge, 43m.; the day tide stand being 58m.; the night, 28m.

T. S. No. 8. Above B. & M. R. R., 51m.; the day tide stand being 1h. 23m., the night 40m.

T. S. No. 7. Head of estuary, above "Ten Hills Farm," 19m.

* The observations of this day are taken as an illustration from the greater number of simultaneous observations made, and from the fact of being an average tide. *Vide* plot of same, sheet H.

the height of the pond is such that no current can pass into it, this average would doubtless be much less. It is this inflow only that the erection of a dam at the outlet would prevent. While the volume of the flow into the pond is possibly of some little value to the *river* in increasing the downward current, the proportion which it bears to the average tidal inflow above Chelsea Bridge, less than one three hundred and twentieth, is too small to allow of its effects being appreciable in the *harbor*, even were the pond not at so great a distance from the latter, that waters therefrom do not in one tide reach it. The tide, in fact, would have commenced to run up the river at Chelsea Bridge some ninety minutes only after the quantity of water flowed into the pond had again flowed into the river.

The average duration of the ebb at Mystic Pond is about twenty hours a day (or ten hours for each tide,) during which time the daily fresh water yield and the water flowed into the pond from the river must pass out of the pond. Now we find that of the ten hours of ebb there are but about five hours during which the ebb current is unobstructed, the flood current colliding therewith during the remaining five hours. The volume of water, then, which flows down during the first five hours of the ebb is alone of value in acting as a scouring agent, and that only in the upper reaches of the river. It should be borne in mind that the time taken in passing from Wood's Mill to the head of estuary, "Ten Hills," 4¼ miles, is about four hours, as calculated from observations; hence there remains but one hour during which any *water from Mystic Pond* passes below the head of the estuary. To reach

Chelsea Bridge, 2½ miles further, assuming even the maximum velocity observed at any time of ebb tide of October 3d,* viz., six tenths of a mile per hour, requires 4h. 10m; or, in other words, *the tide would have turned to run flood, or up the river, at Chelsea Bridge some three and a quarter hours before a drop of water from Mystic Pond could have reached the harbor at Chelsea Bridge.*

From these facts we arrive at the conclusion that Mystic Pond is not a tidal reservoir of value to Boston Harbor.

To exemplify the colliding of the ebb and flood currents, let us take the tidal observations of October 3d. On this day the flood current commenced at the Navy Yard at 7h. 15m., A. M., while it continued to run ebb at Wood's Mill until 1h. 9m., P. M., a period of 5h. 54m.

An average of observations made on board the schooner Bailey, and at the current stations numbered 4, 6 and 7, at other dates than October 3d, show a duration of stand at flood at various points, as follows:

Broad Sound, 7m.

T. S. No. 9. Mystic River above Chelsea Bridge, 43m.; the day tide stand being 58m.; the night, 28m.

T. S. No. 8. Above B. & M. R. R., 51m.; the day tide stand being 1h. 23m., the night 40m.

T. S. No. 7. Head of estuary, above "Ten Hills Farm," 19m.

* The observations of this day are taken as an illustration from the greater number of simultaneous observations made, and from the fact of being an average tide. *Vide* plot of same, sheet H.

T. S. Nos. 6 and 4. Medford Bridge and Wood's Mill, 9m. each.

Now, if, owing to the elevation of the bed of Mystic River, north and west of Medford Bridge, above low water mark of Boston Harbor, the fresh water from Mystic Pond continues to run ebb from five to six hours after the commencement of flood at the harbor, the conclusion to be arrived at is, that the colliding of these currents, by checking the velocity of the flow, is detrimental to the action of the current on the bed of the river, and the fresh water flow acts as a natural dam to the admission of a given volume of tide water which would occupy the bed of the river now occupied by the descending fresh waters. The extensive and increasing shoals near the "Ten Hills Farm" instance the effects due to this colliding action of the currents. Now if the fresh waters flowing from Mystic Pond be retained in the pond during such hours as recent investigations indicate that the tidal inflow up the river would be thereby increased by an amount nearly equal to the volume of the fresh water yield, or as much less as may be found most advisable, a sufficient amount of water for Charlestown or Chelsea may be diverted, and the balance of retained fresh water thrown in in aid of the increased tidal waters at such time of the ebb as experience and investigation show it to be most of benefit to the river; this will admit of as complete, if not better and surer, scouring action than at present. In the making a tidal reservoir of that space now occupied by the fresh water flow from the pond, we may so far imitate nature in the action observable in tidal reservoirs as to expect like results.

Let us suppose Mystic Pond raised as proposed for the "High Level," (*vide* Water Report, Baldwin & Stevenson), or some six feet higher than at present, with a dam at its outlet, near Weir Bridge, so as to make it a fresh water reservoir. The average fresh water yield of the pond in 1859, was estimated at 23¼ million gallons per day; when acting as a storage reservoir, we may safely assume the available yield at all times to equal twenty million gallons, or ten million for each tide. The maximum amount of water required for Charlestown and Chelsea, estimating for 100,000 persons, is six million gallons per day, or three million for twelve hours; this leaves some seven million gallons with six feet head available to increase the tidal flow down the river at every ebb. If we suppose the flow from Mystic Pond stopped so that none of the water flowing therefrom remains in the bed of the river above the estuary at the commencement of flood at that point, the tidal flow up the river will be increased by an amount equal to the retained fresh water; or, taking a similar tide to that of October 3d, as an example, some nine million gallons more of tide water would have passed into the river at each tide. Having some seven million gallons of fresh water retained in the pond in addition to this, under control, with a head of six feet, it would seem that the proposed erections, so far from being detrimental, admit of much more completely conserving the channels of the river, as the loss now due to the meeting of the flood and ebb currents would be avoided, while we have it in our power to increase the velocity of the ebb and the quantity of water that is of value, if at any time desirable.

Relative to the prospective making of Mystic Pond a large tidal reservoir, as has oftentimes been suggested, by deepening and enlarging the river so as to admit more tide water, the following extract from the report of the Harbor Commissioners appointed in 1845, Messrs. E. Lincoln and J. Hayward, will be pertinent:—

"Aside from the damage that such a change in the waters of this pond would do the bordering estates, we are not quite satisfied that such an experiment is altogether desirable in itself. The velocity of the currents in the various parts of the river would be variously increased by the change, and in some parts to a very inconvenient extent. If the channel in the upper section of the river, and into the pond, could be so enlarged that the whole pond would be discharged and filled by every ebb and flood—as the river itself is now—the amount of water passing Chelsea Bridge, in ordinary tides, would be increased 25 per cent. The quantity passing Malden Bridge would be increased 47 per cent.; the increase at the railroad bridge would be 73 per cent.; at Ten Hills Farm the quantity passing would be doubled; and at the mouth of the river proper—at the spur of Winter Hill—120 per cent. more water would pass each tide than does at present. That this additional quantity of water should pass, each tide, *through the present channel*, it would require the average velocity of the current, in these various places, to be increased in the *same ratio*. Suppose that the average velocity of the current at half tide, at the Boston and Maine Railroad Bridge, to be now 4 feet per second, by

making the change proposed the current at the same place, (on the supposition that the pond is emptied and filled each tide through the present channel) must be 7 feet per second. Or suppose that at half flood now, in a given tide, the average velocity at the narrows, the spur of Winter Hill, is 5 feet per second, it would in the case supposed become 11 feet per second. And in any section of the river higher up the change would be proportionally greater. The bottom and sides of the present channel are not adapted to this changed state of the current. Portions of the bed and banks of the river, which have hitherto resisted the action of the water, would yield to this increased action, and incalculable changes in the channel itself would be the consequence.

We are of opinion, however, that if this experiment were tried the results above stated would not be realized to their full extent—as, in the present state of the channel, the pond would not be filled and discharged to the present compass of the tides in the river—and, consequently, the actual velocity of the current would not be as great as is stated in the above hypothesis. But the velocity of the current must be very much increased by such an addition to the capacity of the reservoir; and, probably, large portions of the present bed and banks of the river would be removed from the narrower parts and carried down and deposited in the wider parts below the Ten Hills Farm. The river in this part being eight or ten times as wide as it is at the Narrows, and above, the velocity of the current on the ebb is of course deadened by the expanded character of the channel, and the

marsh mud and other material which the current in its increased velocity may be able to carry with it will be deposited, and the formation of a shoal or bar be the undoubted result. This process would go on till the river had acquired a *permanent state*, that is, till the capacity of the channel should be so enlarged and (for the same reason) the velocity of the current should be so diminished that the sides and bed of the river would be able to resist the further action of the water."

It must be conceded that the area of the tidal basins and rivers adjoining the harbor should be proportionate to the capacity of the channels through which must pass the tidal waters, and, *vice versa*, the channel must be proportionate to convey the requisite volume of water; and if it is designed to make a full tidal basin of the pond, we must have an entrance thereto sufficiently grand to fill it, so that the velocity required does not produce an abrasion of the bed and banks.

Whether the problematical benefit that might ensue from the formation of such a reservoir should be paramount to the interests of so large a community seeking one of the necessaries of life, or would warrant the large expenditure for enlarging and deepening the bed of the river and the alteration and rebuilding of bridges, is extremely doubtful, while the damage it would occasion to one of the most beautiful localities as a place of residence in the vicinity of Boston, is perhaps worthy of consideration.

Samples of water, to ascertain in some measure the saline diffusion in the water, were taken from stations

in the river, and for the satisfaction of the Harbor Commission, from Mystic Pond. Specimens of bottom mud were obtained from all parts of the river, and samples for comparison with these were likewise taken from bottoms of Fresh and Spy Ponds, from Lake Cochituate and Spot Pond. The results obtained from this branch of the examination, while extremely instructive, particularly in relation to the peculiarities incident to Mystic, Fresh, and Spy Ponds, were mainly confirmatory of the conclusions arrived at as shown in a former report; being the more gratifying as showing still more clearly the fitness of the Mystic Pond waters for the uses required in this city. An elaborate report on this subject has been made by Prof. Horsford to the Commissioners.

The facts adduced by the examinations are:—

First—That, as a *tidal basin*, Mystic River is of the utmost importance to the preservation of the channels of Boston Harbor. That its value as such at present extends only to a point between Medford and Mystic Pond.

That said pond is not a tidal reservoir of present value to the harbor.

Second—That the fresh water flow from Mystic Pond is not *appreciable* on the *harbor*, and that a large portion of its flow is detrimental to the *river*. The shoals and mud banks at the head of the estuary, in considerable degree due to its action, in diminishing the volume of the tidal water lessen its power as a scouring agent.

Third—That the erection of a dam at the outlet of Mystic Pond, as proposed by the City of Charlestown,

will not injuriously affect Boston Harbor or Mystic River, but, on the contrary, may be so constructed as to benefit both, by retaining the fresh water flow during such hours as it is now proved detrimental and thereby admitting more tide water into the river, and using a part of the fresh waters thus collected at such times as experience will show them to be most of value in increasing the volume of the ebb current.

Accompanying is a plan and profile of the Mystic River and Pond.

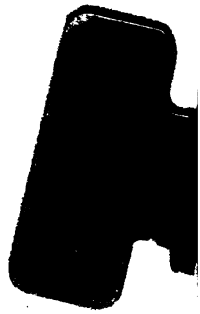
Respectfully submitted,

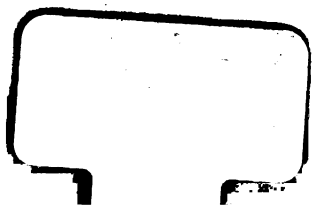
C. L. STEVENSON.

CHARLESTOWN, DEC. 29, 1860.

CABOT SCIENCE LIBRARY
CABOT
CANCELLED
DEC 0 9 1998
DEC 03 1998
BOOK DUE

3 2044 044 874 139





3 2044 044 874 139